

## **REMARKS**

### ***Interview Summary***

In accordance with 37 CFR 1.133(b), please make of record this summary of the March 28, 2006 interview between Examiner Steven J. Ganey and Applicant's representative Trent K. English. Applicant appreciates the opportunity given to interview Examiner Ganey relative to the rejection of independent claims 1, 7, and 13 under U.S.C. §102(b).

During the interview United States Patent Application Publication No. 2002/0071906 to Rusch was discussed. Mr. English pointed out that, although Rusch does disclose the diameter of a throat 21 of a nozzle 2 and the diameter of an exit duct 4 of the nozzle 2, Rusch fails to disclose the entire length between the throat 21 and the exit duct 4. As such, the cross-sectional expansion rate of the nozzle from the throat 21 to the exit duct 4 cannot be calculated. Also, both the Examiner and Mr. English agreed that the drawings are not to scale and the length between the throat 21 and the exit duct 4 cannot be derived from the drawings. Thus, Mr. English and Examiner Ganey agreed that Rusch fails to disclose a nozzle having a cross-sectional expansion rate of at least 1.0 millimeters squared per millimeter, as required by independent claims 1, 7, and 13.

Although the prior art cited in this case fails to disclose a supersonic kinetic spray nozzle including a diverging region having a cross-sectional expansion rate of at least 1.0 millimeters squared per millimeter, the Examiner maintained the belief that prior art may exist which discloses such features. Mr. English contended that the prior art fails to disclose the claimed invention and claims 1-20 are in condition for allowance. Mr. English and Examiner Ganey agreed that Applicant will submit a Request for Reconsideration.

### ***Claims***

Claims 1-20 remain pending in the application as originally filed with claims 1, 7, and 13 being independent. No amendment is currently being made to the application. Applicant respectfully requests that the Examiner reconsider the final rejections in the Final Office Action in light of the Response filed October 17, 2006 and the remarks presented

below.

### ***Allowable Subject Matter***

Applicant respectfully notes the Examiner's indication that dependent claims 2-4, 8-10, and 14-16 stand objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form to include all of the limitations of the base claim and any intervening claims. Applicants appreciate the Examiner's indication of allowable subject matter, but Applicants remain convinced that the broader scope of claims 1, 7, and 13 is patentable.

### ***Withdrawn Rejections***

In the Office Action dated July 17, 2006, the Examiner rejected claims 1, 5-7, 11-13, 17-20 as being anticipated under 35 U.S.C. §102(e) by US 6,808,817 and claims 1-12 as being anticipated under 35 U.S.C. §102(e) by US 6,972,138. Notably, the current Final Office Action is silent with respect to anticipation under 35 U.S.C. §102(e) by US 6,808,817 and anticipation under 35 U.S.C. §102(e) by US 6,972,138. Applicants assume that the Examiner's withdrawal of the rejections under 35 U.S.C. §102(e) based on US 6,808,817 and US 6,972,138 is in response to Applicants' submission of Declarations under 37 C.F.R. §1.132 and 37 C.F.R. §1.131, respectively, in Applicants' Response to Office Action dated October 17, 2007.

### ***Claim Rejections***

Claims 1, 5-7, 11-13, and 17-20 stand rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Application Publication No. 2002/0071906 to Rusch. Applicant submits that the Examiner has failed to show that Rusch anticipates each and every limitation of independent claims 1, 7, or 13 and respectfully requests reconsideration of the final rejection.

In the Examiner's remarks on page 3 of the Final Office Action, the Examiner addresses Applicant's previous response dated October 17, 2006. Specifically, the Examiner "considers the diverging region be the portion after the throat 21 and for at least one inch (i.e. 25.4 millimeters) after in the duct..." (Final Office Action, 1/30/07, pg. 3)

This configuration is depicted below in Figure A, which is an alteration of Figure 1 of Rusch:

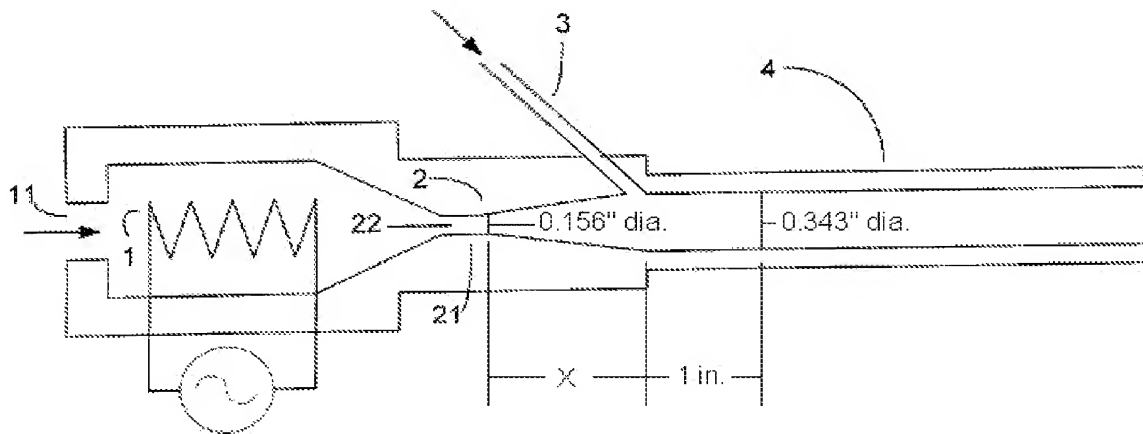


Figure A

The cross-sectional expansion rate of the diverging region required in claims 1, 7, and 13 is equal to the change in the cross-sectional area of the diverging region divided by the length of the diverging region. Of course, this may apply to the entire diverging region or only a portion of the diverging region. An equation for the cross-sectional expansion rate is as follows:

$$R = \frac{A_2 - A_1}{L}$$

where R is the cross-sectional expansion rate,  $A_2$  is the cross-sectional area of the exit,  $A_1$  is the cross-sectional area of the entrance, and L is the length between the exit and the entrance.

Using the values from the configuration shown in Figure A results in the following calculations:

$$A_2 = \pi \cdot r_2^2, \text{ where } r_2 = \frac{0.343in}{2} \cdot \frac{25.4mm}{1in} = 4.36mm, \text{ thus } A_2 = \pi \cdot (4.36mm)^2 = 59.69mm^2;$$

$$A_1 = \pi \cdot r_1^2, \text{ where } r_1 = \frac{0.156in}{2} \cdot \frac{25.4mm}{1in} = 1.98mm, \text{ thus } A_1 = \pi \cdot (1.98mm)^2 = 12.31mm^2;$$

and using the Examiner's determination of the length to be measured,

$$L = X + 1in = X + 25.4mm$$

Using these numbers in the equation for the cross-sectional expansion rate results in the following:

$$R = \frac{59.69mm^2 - 12.31mm^2}{X + 25.4mm}$$

Thus, it can be seen from this equation that **it is impossible to calculate a value for the cross-sectional expansion rate without knowing the value for X as shown in Figure A. Rusch fails to disclose a value for X.** As such, Rusch fails to disclose a cross-sectional expansion rate of at least 1.0 millimeters squared per millimeter, as required in claims 1, 7, and 13. During the interview conducted with Examiner Ganey on March 28, 2007, it was acknowledged that the drawings in Rusch are not to scale and cannot be interpreted as disclosing any value for X.

Further, referring to the last sentence of paragraph 23 of the present application, the prior art nozzle discussed therein includes a cross-sectional expansion rate of from 0.1 millimeters squared per millimeter to 0.5 millimeters squared per millimeter. As discussed by Applicant in the Response to the Office Action dated October 17, 2006, a higher expansion rate in the cross-sectional area of the diverging region, e.g., at least 1.0 millimeters squared per millimeter, leads to a dramatic increase in particle velocity using the same main gas temperature. The rapid expansion of the portion of the diverging region causes a rapid decrease in the gas pressure and a corresponding rapid increase in the gas velocity. The rapid increase in the gas velocity is important in achieving rapid acceleration of the particles. Further, utilizing nozzles designed according to the present invention results in the increase in the deposition efficiency of particles utilizing the same main gas temperature and pressure relative to prior art nozzles. Specifically, an expansion rate of at least 1.0 millimeters squared per millimeter provides a significant benefit to the coating performance.

In view of the remarks set forth above, it is respectfully submitted that the §102(b) rejection of independent claims 1, 7, and 13 in view of Rusch is improper and must be withdrawn. Rusch does not disclose each and every limitation required in claims 1, 7, and 13, and, therefore, does not anticipate these claims. Furthermore, the remaining rejected claims, specifically claims 5-6, 11-12, and 17-20 depend from independent claims 1, 7, and 13, respectively, such that the rejection of these claims is

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also improper and must be withdrawn.

Applicant believes the application is in condition for allowance, which allowance is respectfully solicited. Applicant believes that no additional fees are required, however, the Commissioner is authorized to charge our Deposit Account No. 08-2789 for any additional fees or credit the account for any overpayment.

**Respectfully submitted,**

**HOWARD & HOWARD ATTORNEYS, P.C.**

March 30, 2007

Date

/Trent K. English/

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